Three juvenile Shimofuri goby (18.6 to 33.5 mm total length) were observed at the Delta-Mendota Canal's entrance to O'Neill Forebay on August 22, 1995 — the first observation of this species in the San Luis/O'Neill complex. It is not known whether these juveniles represent reproduction in O'Neill Forebay or transport from the Delta. Because of their collection location, we suspect the latter.

Conclusions

Fish whose native habitat has declined — and whose abundance has declined as a result — have colonized the habitat in at least part of the San Luis/O'Neill complex. Sacramento perch found suitable habitat in San Luis Reservoir and is an example of a native fish that expanded its range to newly created habitat. Wakasagi, a recently arrived exotic species, seems to be dramatically expanding its range and exploiting new habitat. For both fishery and water delivery managers, management implications are associated with development and potential use of new fish habitat. Additional research on the fish communities of CVP canals and reservoirs is being considered.

Brown Bag Seminar

November 20, 1995
11:30 - 1:00
Cafeteria
3251 S Street
Sacramento

Topics:

Understanding How GIS Works
GIS Applications in the Delta and Elsewhere

Featured Speakers:

Kevin Regan and Chuching Wang,
Metropolitan Water District of Southern California
Alan Kilgore (DFG) will be available to address delta GIS applications.

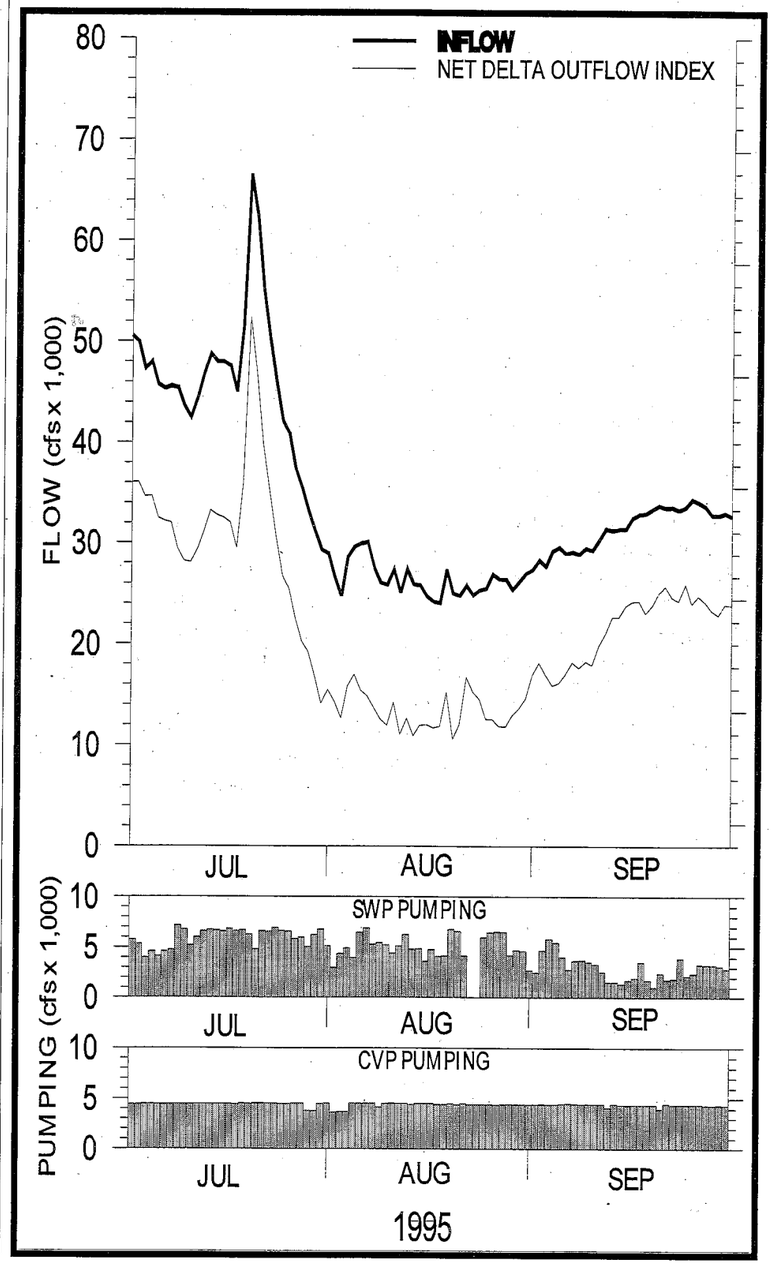
Contact:

Leo Winternitz (916/227-7548)
Karl Jacobs (916/227-0435)

Delta Flows

Kate Le, Department of Water Resources

The July-September Delta Outflow Index averaged about 22,000 cfs. During the latter part of July, peak inflow was about 67,000 cfs and peak outflow was about 52,000 cfs. These peaks are results of high flows due to the Folsom Dam gate failure. Combined SWP and CVP pumping from July through September averaged about 8,900 cfs. Since the CVP was pumping at full capacity, SWP pumping was increased to accommodate the high releases through the failed gate. SWP pumping ceased for 2 days in late August because of maintenance work.



Laboratory Culture of Delta Smelt

Serge Doroshov and Randy Mager, University of California, Davis

Wild juvenile delta smelt captured in fall 1994 were raised to maturity in laboratory tanks. They spawned in May 1995. Eggs were collected and incubated in conical glass jars with upwelling flow. Although spawning results were not entirely satisfactory (most spawnings produced infertile or low fertility eggs), we obtained several batches of eggs of high fertility and hatchability. Mortalities during rearing from juvenile to mature stage were minor, and there was no incidence of *Mycobacterium* disease. Full screen metal content analysis of rearing water was conducted to elucidate potential effect of contaminants on spawning: all metals were below detection limit, except for barium (100 ppb in rearing tank and 120 ppb in the water source, a newly built well at Institute of Ecology. There was no evidence of any toxic effect of barium at this concentration on adult broodstock, but elevated concentration of barium are known to negatively affect the fertilization success in marine invertebrates (Dr. Gary Cherr, Bodega Bay Marine Laboratory, personal communication).

Hatched larvae were raised for the first 3 weeks in static-renewal aquaria at water salinity 5-6 parts per thousand and high stocking density. The continuous culture and production of *Nanochloropsis* oculata (alga) and *Brachionus plicatilis* (rotifer) was established to maintain concentration of algae at about 250,000 cell/ mL and rotifers 10/mL in rearing containers. It was observed that phytoplankton in rearing tanks is required to stimulate feeding activity of larvae. This phase of larval rearing was highly successful: estimated survival was about 80%, and total length of larvae increased from 5 to 12 mm. At 3 weeks after hatching, larvae retained continuous finfold and did not exhibit lumenal dilation of the swim bladders.

At 3-4 weeks after hatching, larvae were transferred to larger tanks with a partial water exchange. Algae, rotifers, and brine shrimp nauplii were added daily. At this age, larvae exhibit strong preference for larger prey, consuming only brine shrimp nauplii. Despite the significant feeding activity and consumption, mortality increased, most likely due to inadequate nutritional value of brine shrimp nauplii. Attempts to use artificial diets at this stage of development failed. The available larval diets are ingested, but they leach rapidly in the water column, resulting in poor water quality. At about 4-5 weeks after hatching, larvae were about 14-15 mm tail length, had differentiated caudal and dorsal fins, and differentiated but not inflated swim bladders. At 6 weeks after hatching, larval survival in rearing tanks was 30-40%.

Larvae were sampled at about 10-day intervals, and data on growth and development will be presented. Preliminary observations suggest larval development of delta smelt from hatching to metamorphosis is generally similar to that of *Osmerus eperlanus* (Urho 1992, Baltic Sea) and likely to *Osmerus mordax* (Cooper 1978) — hatching at 5-6 mm TL; yolk resorption and first feeding at 5 days after hatching; sparse pigmentation with ventral melanophores; differentiation of dorsal, caudal, anal, and pelvic fins at 12-18 mm TL; and swim bladder filling at 17 mm.

There is an overall similarity, with regard to problems and techniques in rearing smelt larvae to metamorphosis, with larval culture of clupeoid fish reviewed by Blaxter and Hunter (1982).

This year, work suggests that laboratory culture of delta smelt is technically feasible but labor-intensive. Broodfish can be raised and spawned in captivity to obtain adequate supplies of fertilized eggs and larvae. Normal growth, development, and high survival of larvae can be maintained during the first 3 weeks of feeding. Further rearing to metamorphosis requires improvement, mainly in larval feeding techniques. Use of new larval diets with enhanced stability in water may be appropriate to pursue.

References

Blaxter, J.H.S., and J.R. Hunter. 1982. The biology of the clupeoid fishes. *Advances in Marine Biology*. J.H.S. Blaxter *et al*, editors. 20:1-223.

Cooper, J.E. 1978. Identification of eggs, larvae, and juveniles of the rainbow smelt, *Osmerus mordax*, with comparisons to larval alewife and gizzard shad. *Transactions of the American Fisheries Society*. 107(1):56-62.

Urho, L. 1992. Morphological and ecological differences in the development of smelt and herring larvae in the northern Baltic Sea. *Sarsia*. 77:1-10.

DAYFLOW Hydrologic Data

A semiannual DAYFLOW update for October 1994 through June 1995 is now available in electronic or paper copy.
The 1995 water year annual DAYFLOW update is scheduled to be available in December 1995.
Contact Sheila Greene (916/227-7538).